UNITED STATES OF AMERICA BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

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Winter 2013-2014)	
Operations and Market Performance in)	
Regional Transmission Organizations)	Docket No. AD14-8-000
and)	
Independent System Operators)	
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STATEMENT OF MICHAEL J. KORMOS EXECUTIVE VICE PRESIDENT – OPERATIONS PJM INTERCONNECTION, L.L.C.

APRIL 1, 2014

My name is Michael J. Kormos. I serve as Executive Vice President, PJM Interconnection, L.L.C. ("PJM"). In this capacity I oversee PJM's operations and planning functions. In response to the February 21, 2014 Notice of Technical Conference and March 19, 2014 Supplemental Notice of Technical Conference issued by the Federal Energy Regulatory Commission ("FERC" or "Commission") in Docket No. AD14-8-000, my testimony will address the impacts of recent cold weather events on PJM and discuss actions taken to respond to those impacts. Specifically, I will address the following:

- 1. the steps PJM took to prepare for the cold weather events;
- 2. the day-ahead operational conditions leading into the events;
- the operator actions taken to address events prior to day-ahead, day-ahead, and in real-time;

- 4. the information available from, and provided to, natural gas pipelines, natural gas marketers, electric generators, and others, as appropriate, and how PJM accounted for that information as part of its operations; and
- PJM's experiences coordinating with the gas markets during this period and the impact on the operation of the bulk electric system and energy market prices.

As you are aware, extraordinarily cold weather gripped the PJM footprint and much of the United States during the winter of 2013-2014. PJM, in its nearly 87-year history, has never experienced the prolonged cold weather of January 2014 across its footprint. Eight of the ten highest winter demands for electricity in the PJM region occurred in January 2014. PJM's new all-time winter peak load of 141,846 megawatts was recorded the evening of January 7, 2014.

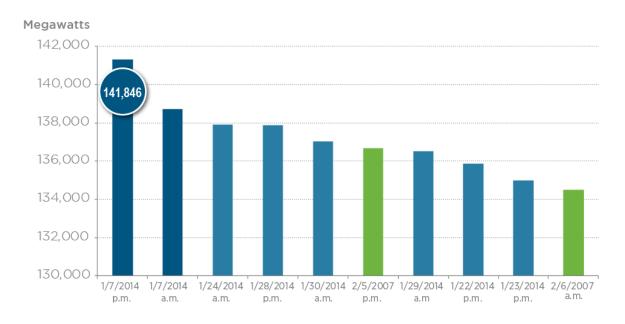


Figure 1: PJM Highest Historic Winter Demands

Demand for electricity was considerably higher this winter, with PJM experiencing many days where demand was 20,000 to 40,000 megawatts above normal

January peaks, an amount equivalent to the power produced by 20 to 40 nuclear generators. In addition, this winter's cold weather resulted in higher than normal generation outages that, along with an increased dependency on natural gas for electric generation, complicated PJM's system operations and resulted in significantly higher wholesale electricity prices. As part of the topics outlined above, I will highlight the challenges PJM was able to meet this winter, and those that we see in the not-so-distant future, as the reliance on natural gas increases and coal generation retires.

I. BACKGROUND AND SUMMARY

During several periods in January, PJM called on all available resources and, at times, issued a public appeal for conservation. Notwithstanding the operating challenges created by increased demand during the extreme cold weather, higher than normal forced outage rates, and an increased reliance on natural gas, PJM's operational planning, real-time operations, and wholesale energy markets "kept the lights on."

Despite PJM's success in meeting customer demand throughout the month of January, the cold weather was not without significant cost in the wholesale market due to high natural gas cost, high levels of generation outages, and sustained periods of peak loads. During this period of high natural gas prices, the terms and conditions for procurement of gas (and its resulting impact on generators) at many times conflicted with the need to dispatch natural gas fired generation either as reserves or over peak periods where their current prices would have dictated. Moreover, the forced outage rate experienced during this time was two to three times higher than the normal winter outage rate of around seven to ten percent and at levels not seen since 1994.

At the time of the peak demand hour on January 7, approximately 22 percent of total installed generation capacity in PJM (of all fuel types) was unavailable because of

forced outages associated with routine equipment breakdowns, problems related to operating in extreme cold temperatures and, fuel-supply issues. Although there has been much focus on gas issues associated with interruptible transportation, overall the gas interruptions were not the major driver of the high forced outage rates experienced in the PJM region. Natural gas interruptions, although significant, removed less than five percent of the total capacity required to meet demand on January 7, while equipment issues associated with both coal and natural gas units made up the far greater proportion of forced outages.

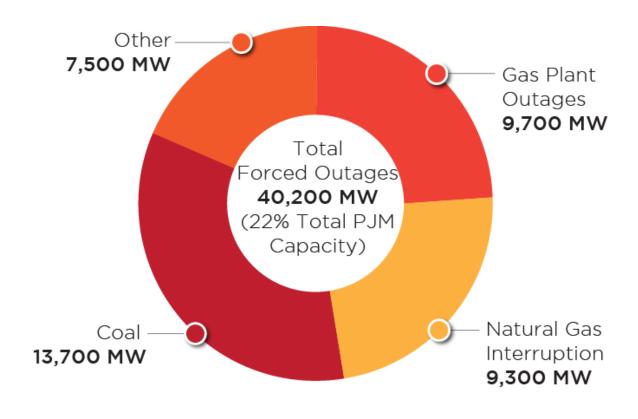


Figure 2: Total Forced Outages¹

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Examples of "Other" include outages caused by boiler air, gas and control systems; storm damage; and electrical issues.

Despite the stress to bulk electric system from cold weather, PJM and its member companies successfully met unprecedented high demand during the January periods of extremely cold temperatures. I would be remiss if I did not thank the various resource owners in the PJM footprint as well as our own operators and staff for the exemplary work they performed over the many stressful hours of January 2014.

II. JANUARY EVENTS

A. Advance Preparation

In preparation for the cold weather, PJM took proactive steps, some based on lessons learned from hot weather events in September 2013, to prepare for the extreme weather conditions. With a focus on load forecasting, operational planning, and advance communications, PJM and its members were able to reliably operate the bulk electric system.

1. Forecasting

To better manage and operate the system for the anticipated high demand caused by extreme weather, PJM utilized conservative forecasts of load for operational planning. Beginning December 2013, PJM began forecasting extreme weather and high loads for early January. On December 31, 2013, PJM's staff meteorologist began tracking a snow storm and approaching cold weather for the PJM region, respectively, on January 2 and 3, 2014, and January 6 and 7, 2014.

Based on the weather forecast, PJM's models forecasted approximately 134,000 megawatts of load for the January 6 to 8 cold weather event. To proactively prepare, PJM utilized a conservative, but realistic, load forecast of 140,000 megawatts for operational planning, a choice subsequently supported by record-low actual temperatures recorded in cities across the PJM region, including Chicago, Pittsburgh, Cleveland,

Columbus, Philadelphia, and Richmond, among others. High temperatures were in the single digits and low teens for many. Low temperatures were 10 to 30 degrees below normal. PJM also monitored and forecasted operating reserves, fuel, outages, unit availability, among other operational parameters to prepare for the event.

For the last two weeks of January, PJM initially forecasted extreme weather conditions similar to those that occurred in the PJM region January 6, 2014 through January 8, 2014. On Friday, January 17, 2014, PJM was particularly concerned with forecasted conditions for January 21 due to a high forecasted load, the difficulty of forecasting temperature drops, and the less certain demand after the Martin Luther King Jr. holiday weekend. Over the weekend (January 18 to 19), PJM's revised forecasts indicated lower loads than initially forecasted. On January 21 and 22, a snowstorm resulted in snow accumulation of approximately one foot between Philadelphia and New York with lesser totals across other parts of the PJM region. Snow and ice caused both a loss of service to customers at the distribution level and many business and school closings, which resulted in lower than expected load levels and higher operating reserve rates.

2. Operational Planning and Advance Communications

Throughout January, PJM communicated with natural gas pipelines and other stakeholders regarding the severe weather. Overall, gas operators expected very tight supplies and expressed doubt that any interruptible transportation would be available through most of that week and in particular on January 7. As a result of projected conditions for January 7, 2014, many units expecting fuel issues switched from natural gas to oil in order to ensure availability during the tight pipeline capacity conditions.

At least four days in advance of each projected peak load day, PJM prepared an operational plan and communicated with stakeholders regarding the extreme cold weather and projected loads. Each day leading up to the peak, PJM revised its plan based on revised forecasts and system conditions.

For example, three days prior to the cold weather event of January 6 to January 8, PJM held its first operational call with the major gas pipeline operators to discuss conditions through the week starting January 5. Two days prior to January 6, PJM refined the plan by including additional detail based on more certain weather conditions. One day prior, PJM issued alerts; increased the frequency of communications with transmission owners, generators, and natural gas pipelines, and other relevant stakeholders; finalized staffing plans; and finalized unit commitments.

Furthermore, on January 3, 2014, PJM requested from the Commission a waiver of confidentiality provisions in the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("Operating Agreement") to permit PJM to share certain non-public, operational information with interstate natural gas pipelines serving PJM-member generation, to ensure reliability. The Commission granted the waiver on January 6, 2014.² PJM utilized this authority to review the day-ahead commitment, on a confidential basis, with pipeline companies to confirm the availability of gas supplies to the various generators being committed in real time. Although we need to continue to evolve the level and depth of those communications, this level of communication was a significant leap forward from prior practice for PJM and the pipelines in our region. Unexpected generation interruptions significantly impact the reliability of the bulk

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PJM Interconnection, L.L.C., Order Granting Waiver, 146 FERC ¶ 61,003 (2014).

electric system. The communications with the pipelines this winter considerably reduced this uncertainty by raising: (1) PJM's awareness of the availability of gas supplies to the various generators; and (2) the pipelines' awareness of the generators that would be withdrawing natural gas from their pipelines.

Additionally, in anticipation of the cold weather forecasted for the last two weeks of January, PJM sought and received two waivers to compensate resources for higher prices. The first waiver allowed PJM to provide make-whole payments to generators whose costs, due to the high natural gas prices, would result in cost-based offer above the existing \$1,000 per megawatt-hour offer cap. The Commission granted that waiver providing PJM authority to compensate those generators through uplift charges to wholesale power buyers.³ Subsequently, FERC approved a second waiver allowing cost-based offers to exceed the cap and set the locational marginal price ("LMP") for energy.⁴ Reflecting the higher costs in LMP rather than in ancillary service charges ensures price transparency and enables wholesale power buyers to hedge against higher costs. We are grateful for the Commission's timely action and responsiveness to our requests. The Commission's actions sent a number of stabilizing messages to resource owners and pipelines at a critical period during the height of the cold weather.

B. Day-ahead Operational Conditions Leading into the Event

In addition to forecasting the load and scheduling generation to meet that load, PJM also took into consideration the probability of unplanned generator outages that could occur during the operating day and scheduled additional reserves that could be on-

³ *PJM Interconnection, L.L.C.*, Order Granting Waiver, 146 FERC ¶ 61,041 (2014).

⁴ *PJM Interconnection, L.L.C.*, Order Granting Waiver, 146 FERC ¶ 61,078 (2014).

line within 30-minutes to ensure the potential outages would not jeopardize system reliability. The percentage of unplanned generator outages that may occur is based on historical forced outage rates. However, knowing that the extreme low temperatures for January 6 and 7 were a rare occurrence that could cause significant problems for generators and the gas pipelines, the PJM operators modeled and planned for a higher than normal forced outage rate. Utilizing this in our forward looking transmission studies, Dispatch Scheduling Tool, Day-Ahead Energy Market and Reserve Adequacy Case, PJM was able to schedule adequate generation to be on-line or available to quickly start if needed. In addition, PJM also coordinated closely with the generator owners to not only stay aware of the gas supply concerns, but also of all fuel supplies such as coal and oil, particularly for dual-fuel units.

C. PJM Actions Day-ahead, and in Real-time

Day-ahead and real-time, PJM managed the impacts of the severe weather on the transmission system with day-ahead alerts, real-time warnings, real-time actions, internal and external communication and coordination, and iterative refinement of the operational plan. PJM also held daily calls with its neighboring balancing authorities to assess their situations.

PJM, through its emergency procedures, called on all available resources, issued a public appeal for conservation, and requested voluntary reductions by load management resources. During the month of January, PJM issued the following combination of warnings, alerts, and actions:

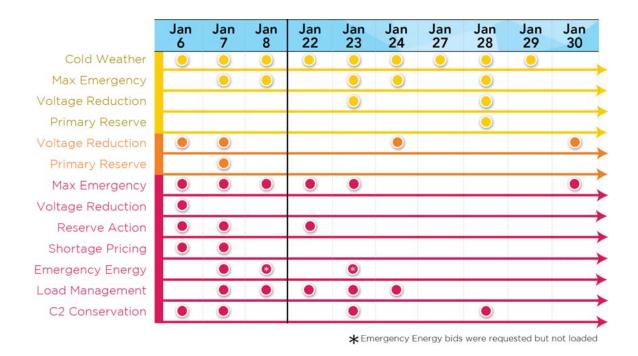


Figure 3: Emergency Operations

III. INFORMATION DISTRIBUTION TO AND FROM APPLICABLE STAKEHOLDERS

In addition to the communication mentioned above, PJM held System Operations Subcommittee Transmission group calls on a daily basis to discuss system conditions.

A. Natural Gas Coordination

The challenges PJM and its members experienced with the natural gas markets were two-fold. There were natural gas pipeline delivery issues and natural gas market issues. With respect to deliverability, given the sheer number of generation resources in PJM with interruptible gas transportation and the potential impact gas interruptions could have, the actual impact of interruptions, while not insignificant, accounted for outages of only approximately five percent of the total capacity required to meet demand during

peak hours.⁵ While the interruption of natural gas is a concern, and will be even more for the future, the overall impact of gas interruptions was manageable and more importantly better understood.

Notably, it was not the gas transportation issues but rather some of the gas procurement issues that had a greater impact on system operations, dispatch, and ultimately price. Specifically, in preparation for the cold weather expected the week of January 17, PJM was asked by owners and operators of generating units to commit their units on the preceding Friday, outside of the normal day-ahead energy market commitment period, to run through the entire weekend to assure gas was available for the following Tuesday morning. This need for an early and long-term commitment was due to the inability or limited ability of generators to buy gas for a single day, various "take or pay" provisions, and extraordinary prices. The relative lack of transparency of these secondary markets, which often bundle transportation and supply, left PJM in the untenable position of being asked to commit generators prior to the Day-ahead Energy Market or risk not having available a unit needed for reliability due to the inability to get gas and transportation when the units were needed to serve load. While PJM can deal with high prices, the combination of high prices coupled with the absolute inflexibility to manage the units economically significantly increased costs and complexity in scheduling and dispatching. Under normal market conditions, natural gas prices of a \$100 per MBtu result in gas-fired units being utilized as reserves or peaking units, generating only a few hours at high costs to meet peak load requirements. During the extreme cold weather

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As stated above, natural gas interruptions removed less than five percent of the total capacity required to meet demand on January 7, while equipment issues associated with both coal and natural gas units made up the far greater proportion of forced outages.

events of January, PJM was required to schedule these high-cost peaking units over an extended duration, or risk the peaking units being altogether unavailable. Such a function is typically reserved for baseload units designed to run continuously at much lower costs.

IV. CONCLUSION

Among the challenges for PJM and its members in maintaining grid reliability during the month of January were uncharacteristically high unplanned generator shutdowns from the cold and the stress of extended run times, natural gas interruptions, and fuel-oil related issues (e.g., delivery, emissions, water for NOx reduction, operating restrictions, etc.). All conventional forms of generation, including gas, coal and nuclear plants were challenged by the extreme conditions. Because the frigid weather also affected neighboring grid areas, the availability of imported power to help meet demand and increase reserves was also frequently limited.

The amount of unavailable generation was unprecedented. PJM has not experienced temperatures this cold since the 1970s and 80s. Moreover, the last time generator failure rates were this high was January 1994 during the "Deep Freeze" event in which rotating blackouts were implemented for several hours. To address the outage rate, PJM plans to increase winter testing requirements for generators.

The electric power industry is in the midst of the greatest fuel shift in its history, and the PJM wholesale energy markets are managing through the transition. Coal-fired generating units are retiring in the face of low natural-gas prices, low load growth, new renewable power resources and the cost of adding pollution controls to meet state and federal emission standards. At the same time, natural gas has been the fuel of choice for current new generation on the PJM system due to its low cost, short construction time frame, and relatively limited emissions when compared to other sources. Future years

will have a different mix of resources committed to meet consumers' needs, bringing with it benefits and challenges. PJM continues to actively addressed reliability needs for the future. Through the Reliability Pricing Model capacity auctions we have maintained not only required reserve margins but additional reserves. The committed resource mix including new generation, demand response, and additional imports are sufficient to preserve reliability. As we go through the transition, PJM will maintain reliability. Nevertheless, because less expensive coal generation is retiring and in part is being replaced by demand response or other potential high energy cost recourses, excess generation will narrow and energy prices could become more volatile due to the increasing reliance on natural gas for electricity generation. As the generation fuel mix changes, the resources available to meet peak demands in extreme winter weather will be different.

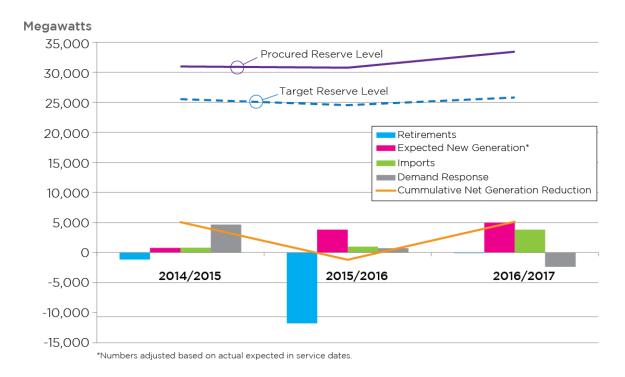


Figure 4: Generation Retirement

As more generation in PJM is natural gas-fired, PJM and the electricity industry have been working with the natural gas pipeline operators to better coordinate operations of the electric power grid and the gas pipelines with the electric and gas markets. PJM established a Gas Electric Senior Task Force, comprised of PJM stakeholders, which has been reviewing the specific timing of the PJM markets relative to different alternatives for gas pipeline nomination schedules. In January, PJM shared confidential information with natural gas pipelines serving our footprint to ensure reliable power supplies. Subsequently, PJM filed for approval of changes that would allow information sharing permanently.

The unusual arctic temperatures made January 2014 a challenging month for grid operations, generators, fuel supplies, markets and customers. Through it all, PJM and its members maintained the vital flow of power to consumers. PJM, its members, and the industry are learning from the experience. PJM continues to work with members, stakeholders and regulators to provide information and analysis of operations and markets during January 2014 and to ensure the long-term reliability of the electric power supply system, and the stability and competitiveness of PJM's wholesale energy markets.

Thank you for your consideration and allowing PJM to provide its perspective.